

# PATENT SPECIFICATION

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## (54) DECORATIVE PAPER OVERLAID PLYWOOD AND PROCESS FOR THE MANUFACTURE THEREOF

(71) We, TOYO BUSSAN Co., LTD., a joint-stock company organised and existing under the laws of Japan, of No. 23-18, Matsue-cho, Nakagawa-ku, Nagoya-shi, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to improvements in or relating to a plywood panel with a simulated wood grain pattern.

Lauan is much used in the manufacture of plywood and since lauan is, in general, a porous wood with elongate, relatively shallow and narrow recesses, plywood formed from lauan panels is treated, on its exposed surface, in a manner to cause it to lose the appearance of an inexpensive wood, and to resemble an expensive hardwood panel so that it can be used in furniture, wall panelling and like wooden products.

Various attempts have heretofore been made to cause such a plywood to resemble a wood panel with a natural wood grain pattern, and there have been proposed various kinds of plywood panels with simulated wood grain patterns.

A common feature of such conventional plywood panels is that the surface of a plywood is fully covered with an overlay paper, plastics sheet, layer of resin coat or the like so that the aforementioned recesses disappear completely behind the same and a smooth surface, on which a simulated wood grain pattern is represented, is formed on the plywood surface. In other words, in the prior art efforts have been concentrated upon how such recesses should be invisibly covered and how an artificial wood grain pattern that well resembles a natural wood grain pattern should be represented on a smooth

surface formed over the surface of the plywood. For example, in a known decorative overlay paper covered plywood the overlay paper used is considerably thick 75 microns or more and has a weight, when dry within the range of from 60 to 140 grams per square meter. Accordingly, the aforesaid recesses in the plywood are completely covered with such paper and are not visible or perceptible at all.

We have found that the best way to give an appearance of a real wood grain pattern to a plywood of lauan or like wood is to utilize the natural recesses of the plywood, as wood grain pattern elements, without uniformly smoothly covering the recesses also in order to incorporate or reflect the configurations of the recesses into a simulated wood grain pattern to be represented on the surface of the plywood, the use of a very thin overlay paper is necessary which, when bonded to the surface of the plywood with an adhesive, can be formed with a number of elongate, relatively shallow and narrow recesses corresponding to the natural recesses of the plywood. According to the invention the overlay paper has a dry weight within the range of from 17 to 30 grams per square meter and has a thickness within the range of from 35 to 50 microns.

In one aspect of the invention, there is provided an plywood with a simulated wood grain pattern, comprising a base plywood having in the face surface thereof a plurality of elongate, shallow and narrow recesses, a decorative overlay paper being colour printed with a desired wood grain pattern, a resin adhesive bonding the paper to the surface of the plywood, the paper having a weight, when dry, in the range of from 17 to 30 grams per square metre and having a thickness, when dry, in the range of from 35 to 50 microns, and a layer of a heat-cured transparent resin coated on the

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paper, the layer being sufficiently transparent so that the coloured wood grain pattern is distinctly visible therethrough, and the paper and the layer being formed with a plurality of recesses corresponding generally to the recesses of the base plywood.

In another aspect of the invention, there is provided a process for the manufacture of a plywood with a simulated wood grain pattern, comprising the steps of: coating the surface of a base plywood with a resin adhesive, the surface having therein a plurality of elongate, shallow and narrow recesses; partially drying the adhesive coated on the surface of the base plywood; bonding to the surface by means of the adhesive decorative overlay paper having a weight, when dry, in the range of from 17 to 30 grams per square metre and having a thickness, when dry, in the range from 35 to 50 microns and also being colour printed with a desired wood grain pattern; coating a thermosetting transparent resin on the overlay paper to form thereon a transparent layer; pressing the transparent layer against the bonded overlay paper by means of a roller to form in both the paper and the layer a plurality of recesses corresponding generally to the recesses of the base plywood and heat curing the transparent layer with such recesses.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:—

Fig. 1 is a flow diagram showing the sequence of the respective operations for manufacturing a plywood panel;

Fig. 2 is a partly broken away plan view of a plywood panel;

Fig. 3 is a perspective view of the product shown in Fig. 2 in an enlarged scale;

Fig. 4 is a cross-sectional view, in an enlarged scale, taken along the line A-A of Fig. 2; and

Fig. 5 is a cross-section of a plywood panel.

A suitable resin adhesive such as a blend of a urea resin and a vinyl acetate polymer is applied to the face surface 10 of a base plywood 11 formed of lauan or like wood by passing the base plywood through roll coaters 12 to which the adhesive is fed from an adhesive feeder 13. In this coating operation, a plurality of elongate, shallow and narrow recesses 14 in the surface 10 should not be fully filled with such adhesive. Preferably, a relatively small quantity of such adhesive is deposited in each of the recesses 14. However, certain recesses such, for example, as those with very small openings do not require the entry of the adhesive at all.

Then, the adhesive coated base plywood 11 passes to a drying oven 15 wherein the adhesive layer 16 is partially dried so that the layer is secured to the surface 10 of the base plywood. Thereafter, a thin decorative overlay paper 17 on which a wood grain pattern 17a simulating, for example, the grain of oak, walnut, or rosewood, is colour-printed is fed from a spool 18 to press-rollers 19 and is pressed onto the adhesive layer 16 on the base plywood so that the overlay paper 17 is bonded to the surface 10 of the plywood.

As previously referred to, the overlay paper 17 to be bonded to the surface has a weight, when dry, in the range of from 17 to 30 grams per square metre and has a thickness, when dry, the range of from 35 to 50 microns. Also, it should have, on its face side, a smooth surface smooth enough to receive photographic reproduction of wood grain, and on its reverse side, a rough surface well adapted to be securely bonded to the surface 10 of plywood by the resin adhesive. Moreover, the overlay paper is preferably semi-transparent and is adapted to be permeated with a resin adhesive or coat in order that when the paper is adhesively secured to the surface 10 of the plywood 11, the natural recesses in the surface can be better utilised to enhance the simulative effect of the wood grain pattern 17a printed on the paper.

A thermosetting transparent resin, such as amino-alkyd resin, is coated on the overlaid paper 17 by passing the plywood 11 through roll coaters 20 to which the resin is fed from a feeder 21. Then the transparent resin coat applied to the paper is pressed against the bonded overlay paper 17 by means of press rollers 22, whereby a thin layer 23 of the resin is formed on the paper and at the same time the paper 17 is formed with a plurality of recesses 14a corresponding to the recesses 14 of the surface 10 of plywood 11. Thereafter the plywood thus treated is passed to a second drying oven 24 to heat-cure the coating layer 23. As this thin transparent surface layer 23 is heat-cured, recesses 14b of the layer which are formed when the recesses 14a of the paper are formed, become hardened in the forms corresponding generally to the recesses 14a of the overlay paper 17 and combine with the simulated wood grain pattern 17a printed on the overlay paper to thereby enable the grain pattern to be naturally and embossedly viewed as a whole.

If desired, in addition to such recesses 14b, a suitable number of additional recesses 14c which simulate the natural recesses 14 of surface 10 may be press-formed on the transparent coating layer 23 by means of a known embossing roller means,

not shown. In this case, such simulated recesses 14c must be formed such that they extend intermittently in the general direction of the wood grain pattern 17a, in order that such recesses 14c can really resemble the natural recesses. Furthermore, a plurality of V-shaped, U-shaped, semi-circular or like wide grooves 25, may be formed in the surface of base plywood 11, if desired. Where such grooves are formed, they should be coated with paint of a different colour from the colour of the grain pattern 17a so that each of the coloured grooves 25 simulates the side edges of two adjoining wood panels that are joined together.

The thin overlay paper 17 described has proved to be not only stronger mechanically, but also much more effective in causing the plywood to resemble a high grade wood panel than the thick paper previously referred to, the thick paper having at least 75  $\mu$  in thickness.

As may be seen from the foregoing, with the use of such thin decorative overlay paper, the natural recesses and touch of the face surface of base plywood can be effectively utilized as elements for enhancing the simulative effect of a wood grain pattern to be represented on said surface. Thus, the present invention makes it possible to give an appearance of a high grade wood to an inexpensive plywood.

#### WHAT WE CLAIM IS:—

1. A plywood with a simulated wood grain pattern, comprising a base plywood having in the face surface thereof a plurality of elongated, shallow and narrow recesses, a decorative overlay paper being colour-printed with a desired wood grain pattern, a resin adhesive bonding the paper to the surface of the plywood, the paper having a weight, when dry, in the range of from 17 to 30 grams per square metre and having a thickness, when dry, in the range of from 35 to 50 microns, and a layer of a heat-cured transparent resin coated on the paper, the layer being sufficiently transparent so that the coloured wood grain pattern is distinctly visible therethrough, and the paper and the layer being formed with a plurality of recesses corresponding generally to the recesses of the base plywood.

2. The plywood according to claim 1, wherein the overlay paper is semi-transparent and is adapted to be permeated with a resin adhesive or coat.

3. The plywood according to claim 1, wherein the overlay paper has been formed, on its face side, with a smooth surface and, on its reverse side, with a rough surface.

4. The plywood according to claim 1, wherein a plurality of additional recesses simulating the recesses of the surface have been press-formed in the transparent coating layer.

5. The plywood according to any one of claims 1 to 4, wherein a plurality of wide grooves are formed in the face of the plywood, these grooves being coated with a paint of a colour different from the colour of the wood grain pattern.

6. A process for the manufacture of a plywood with a simulated wood grain pattern, comprising the steps of: coating the surface of a base plywood with a resin adhesive, the surface having therein a plurality of elongate, shallow and narrow recesses; partially drying the adhesive coated on the surface of the base plywood; bonding to the the surface by means of the adhesive a decorative overlay paper having a weight, when dry, in the range of from 17 to 30 grams per square metre and having a thickness, when dry, in the range of from 35 to 50 microns and also being colour-printed with a desired wood grain pattern; coating a thermosetting transparent resin on the overlay paper to form thereon a transparent layer; pressing the transparent layer against the bonded overlay paper by means of a roller to form in both the paper and the layer a plurality of recesses corresponding generally to the recesses of the base plywood and heat curing the transparent layer with such recesses.

7. The process according to claim 6, which includes press-forming on the transparent coating layer a plurality of additional recesses simulating the recesses of the surface of the base plywood.

8. The process according to claims 6 or 7, which further includes forming in the face of the plywood a plurality of wide grooves and coating the grooves with a paint of a colour different from the colour of the wood grain pattern.

9. A process for the manufacture of a plywood with a simulated wood grain pattern substantially as hereinbefore described with reference to the accompanying drawings.

10. A plywood manufactured according to any one of Claims 6 to 9.

11. A plywood with a simulated wood grain pattern substantially as described with reference to the accompanying drawings.

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